

10/533966

JC14 Rec'd PCT/PTO 05 MAY 2005

**ENGLISH TRANSLATION
OF THE ANNEXES TO THE
INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

WHAT IS CLAIMED IS:

1. A light emitting device comprising at least one electroluminescent element (1) and a diffractive optical element (12) arranged to influence light emitted by the electroluminescent element (1), **characterized in that** the diffractive optical features of the diffractive optical element (12) are designed according to the output light distribution of the one or more electroluminescent elements (1),
5 and wherein the electroluminescent element (1) is arranged in a housing (2) and/or substrate coupled to the diffractive optical element (1), and the design of the diffractive optical features of the diffractive optical element (12) also incorporates the shape and reflection characteristics of the underlying housing
10 (2), with the points of the housing receiving light from the source being assumed to act as secondary Lambertian point sources.
2. A light emitting device according to claim 1, wherein symmetry characteristics
15 of the diffractive optical element (12) correspond to symmetry characteristics of the electroluminescent element (1), as well as to the symmetry characteristics of the desired emission characteristics.
- 20 3. A light emitting device according to one of the claims 1 to 2, wherein the diffractive optical element (12) is shaped in an at least partially transparent layer (11) which covers a light emitting surface of the electroluminescent element (1).
- 25 4. A light emitting device according to claim 3, wherein the layer (11) does not extend over the light emitting surface of the electroluminescent element (1).

- 2 -

5. A light emitting device according to one of the claims 1 to 4 comprising a housing and/or substrate (2) for accommodating the electroluminescent element (1) and current supply means for the electroluminescent element (1) , wherein the diffractive optical element (12) is coupled to the housing and/or substrate (2).
5
6. A light emitting device according to claim 5, wherein said diffractive optical element (12) is directly and irreversibly fixed to the housing and/or substrate (2).
10
7. A light emitting device according to claim 5 or 6 comprising an LED (light emitting diode) further comprising an LED chip as the electroluminescent element (1), a housing and/or substrate (2) and an at least partially transparent material (3) surrounding the electroluminescent element (1), wherein said diffractive optical element (12) is made up of diffractive optical structures (12) on a surface of an at least partially transparent layer (11) attached to said at least partially transparent material (3).
15
20
8. A light emitting device according to claim 5 or 6 comprising an LED (light emitting diode) further comprising an LED chip as the electroluminescent element (1), a housing and/or substrate (2) and an at least partially transparent material (3) surrounding the electroluminescent element (1), wherein said diffractive optical element is made up of diffractive optical structures (12) on a surface of said at least partially transparent material (3).
25

- 3 -

9. A light emitting device according to claim 7 or 8, wherein said at least partially transparent material (3) comprises light influencing additives, in particular a fluorescent material.
- 5
10. A light emitting device according to any one of the previous claims wherein said diffractive optical element (12) comprises a plurality of independent sections each having an individual optical function.
- 10
11. A light emitting device according to any one of the previous claims, wherein said electroluminescent element (1) comprises a light emitting surface wherein the light emitting surface is covered by at least partially transparent material (3), the at least partially transparent material (3) defining a first surface, wherein an at least partially transparent layer sticks to said first surface and defines a second surface essentially parallel to said first surface, and wherein said diffractive optical element (12) is made up of diffractive optical structures present in said second surface.
- 15
12. A light emitting device according to any one of the previous claims, wherein said diffractive optical structure (12) comprises features having characteristic depths and/or heights of between 0.5 micrometers and 200 micrometers.
- 20
13. A method for manufacturing a diffractive optical structure that is to be used in a light emitting device in conjunction with an electroluminescent element arranged in a housing (2) and/or substrate, the diffractive optical structure being arranged to influence light emitted by the electroluminescent element (1), comprising the steps of
- 25
- 30

- 4 -

- modeling the light emission of the electroluminescent element (1) as an array of point sources, each point source having the same angular light distribution as the electroluminescent element as a whole, whereas the intensity is optionally adapted to a local emission strength of the electroluminescent element;
- 5 • modeling light emission of secondary point sources corresponding to points where light leaving the electroluminescent element is reflected by said housing (2) and/or substrate before reaching the diffractive optical structure, and modelling the light emission of secondary point sources as being lambertian;
- designing, for the desired light beam shape, a beam shaping optic for each point
10 source;
- combining the beam shaping optics for all point sources, generating a total optical function; and
- generating a surface profile for the diffractive optical structure according to the total optical function.

15